

# WHAT KIND OF CONTINENTAL MARGIN AM I? ACTIVE OR PASSIVE?

## A HOMEWORK OR LABORATORY ACTIVITY

### PURPOSE

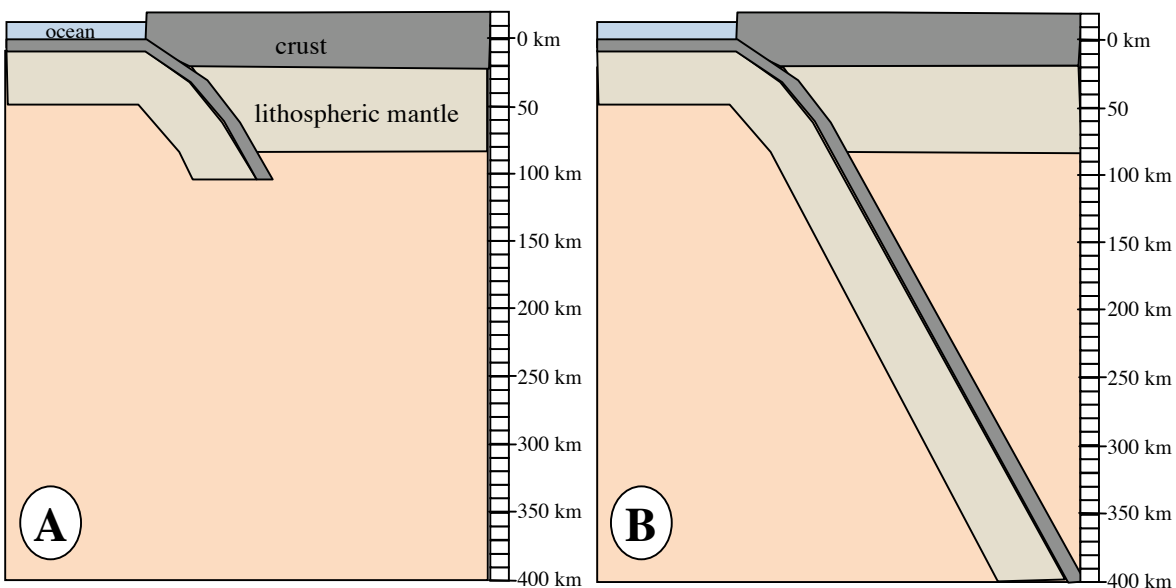
- Utilize earthquake data to locate subducting slabs
- Examine topographic data to determine volcanic arc locations relative to trenches
- Integrate earthquake, volcano, and topographic data to distinguish between passive and active margins
- To introduce GeoMapApp, an easy-to-use mapping program focused on marine geology and geophysics

### OVERVIEW

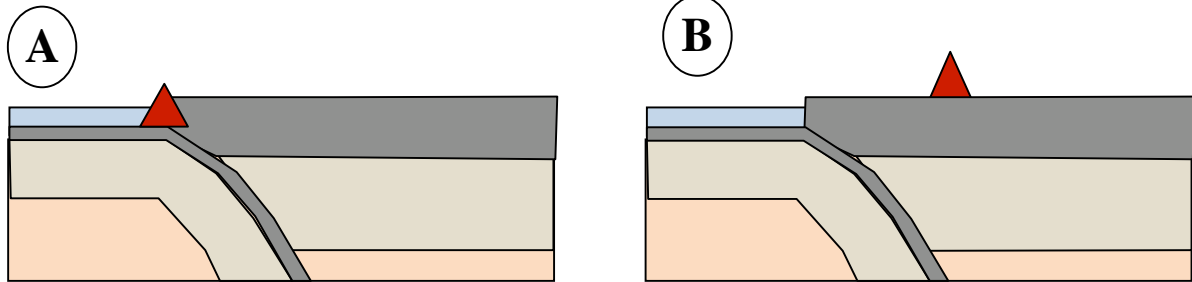
After you answer some quick questions about subduction zones and volcanic arcs, follow the directions given below to accomplish several tasks in GeoMapApp.

### INITIAL QUESTIONS

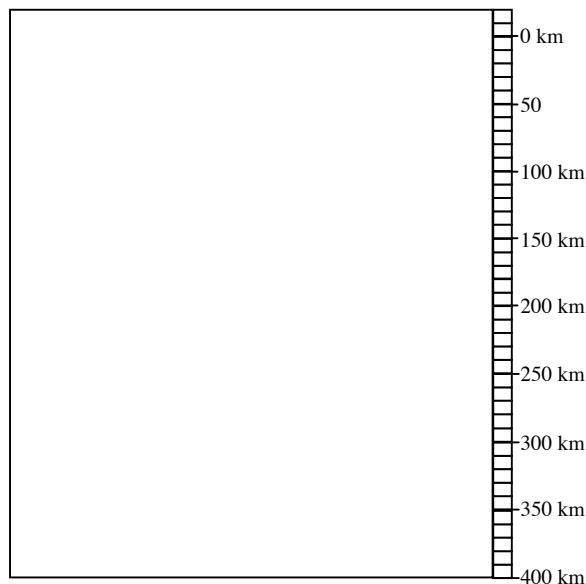
Examine the following figures showing vertical cross sections into Earth.



- 1) Which profile shown above represents a typical subduction zone? A or B



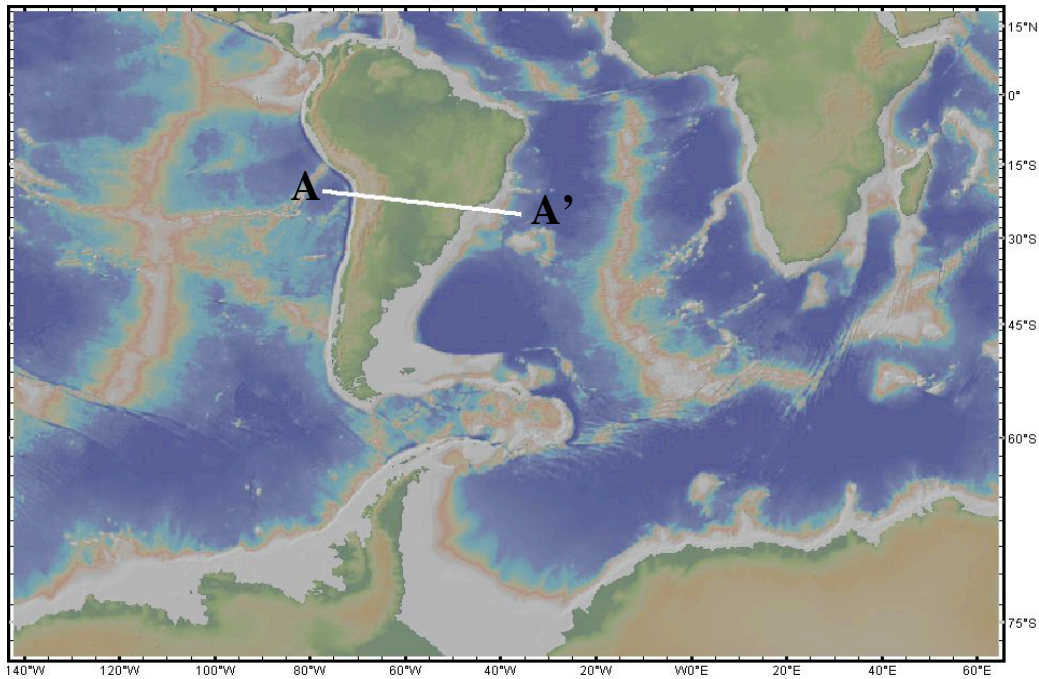
- 2) On the above profiles, the triangles indicate volcanic arcs. Which profile represents the appropriate location of a volcanic arc?      A      or      B
- 3) Draw a new profile in the box below, which includes an appropriate subduction zone and volcanic arc.



## GEOMAPAPP

Download GeoMapApp onto your computer or laptop. Go to <http://www.marine-geo.org/> and follow the instructions for downloading. Help pages can be found at <http://www.geomapapp.org/GMA/newHelp/index.html>. Scroll to the bottom of the page for an explanation and photo of the toolbar buttons referred to below. Many of them also have multimedia tutorials.

After downloading the program, double-click on the GeoMapApp.jar icon to run the program. You will first load earthquake and volcano data, then draw a cross-sectional profile across South America. Instructions given are for GeoMapApp version 2.0.



#### *Earthquake Data:*

First click on the Grid toolbar button at the top of the screen, then click on “Portals” menu function and click on “Earthquake Locations, Epicenter Depths and Magnitudes (ISC).” The default depth range is 0-800 km, the default magnitude range is 5.0-9.0, and default years are 1964-1995. The default values are used in this exercise but can be changed for other uses via the text boxes on the lower right on your screen.

#### *Volcano Data:*

Click on the “Datasets” menu function, point to “Volcanoes and Seamounts” and click on “Location and Aster Satellite Images of Major Volcanoes.”

#### *Cross-Sectional Profile:*

Next, zoom in on South America via the Zoom toolbar button, so that you have a map view similar to the one below on your screen. Draw a cross-sectional profile from A-A’ using the Distance/Profile toolbar button. Make sure you are drawing the cross section along a straight line. Save the profile to your computer.

Print out your topographic profile and the map showing the earthquake and volcano locations.

- 4) On your topographic profile across South America, identify these features:
  - a. Label the trench.
  - b. Draw  $\Delta$ 's on the land surface to illustrate where volcanic activity occurs.
  - c. Place an X over the location of the deepest earthquakes.
  - d. Identify the overriding and subducting plates.

- e. Identify the passive and active margins based on your earthquake and volcano locations.
- 5) Look back at the schematic diagrams at the beginning of this exercise. Is your profile and map of South America consistent with your answers? If not, perhaps you should reconsider your answers.

Turn in your profile, map, and this handout.

## **REFERENCES**

This exercise was developed as a MARGINS Mini-Lesson by Laura Reiser Wetzel of Eckerd College, Karen Bemis of Rutgers University, Cindy Palinkas of the University of Maryland Center for Environmental Science, and John McDaris of SERC on May 28, 2009. It may be downloaded from <http://serc.carleton.edu/dev/margins/minilessons>.